CMC Centro Misure Compatibilità S.r.l.
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Independent Testing Laboratory

TEST REPORT nr. R14235901

Federal Communication Commission (FCC)

Test item

Description ..... :	TRACKING SENSOR FOR REAL TIME LOCATION SYSTEM
Trademark ..... :	MYSPHERA
Model/Type ..... :	TAGBS0203
FCC ID ..... :	2ACLYTAGBS0203

Test Specification

Standard..... :	FCC Rules & Regulations, Title 47:2013 Part 15 paragraph(s): 203, 209 and 247

Client's name ..... :	TSB REAL TIME LOCATION SYSTEMS SL
Address ..... :	Ronda Auguste Y Louis Lumiere, 23 Nave 13 – Parque Tecnológico Valencia – 46980 Paterna – SPAIN
Manufacturer's name :	Same as client
Address ..... :	--

Report

Tested by ..... :	A. Bertezzolo – *Technician*
Approved by ..... :	R. Beghetto – *Laboratory Manager*
Date of issue ..... :	04.05.15
Contents..... :	46 pages

Index

1. Summary

Standard:

FCC Rules & Regulations, Title 47:2013
Part 15 paragraph(s): 203, 209 and 247

Test specifications	*Environmental Phenomena*	*Tests sequence*	*Result*
Part 15.203	Antenna requirements	1	Complies
Part 15.209	Emissions in restricted frequency bands and in unrestricted frequency bands	2	Complies
Part 15.209	DTS bandwidth	3	Complies
Part 15.247 (d)	Band edge	4	Complies
Part 15.209 and 15.247	Fundamental emission output power	5	Complies
Part 15.209 and 15.247	Maximum power spectral density level in the fundamental emission	6	Complies
Part 15.209	Spurious emission	7	Complies

The Test Report was given to the Client representatives for necessary documentation of ratification of the tested equipment and it is valid for the FCC certification

2. Description of Equipment under test (EUT)

Power supply	:	3 Vdc from battery
Serial Number	:	--
Type of equipment	:	☑ Transmitter Unit
		☑ Receiver Unit
Type of station	:	❑ Fixed station
		☑ Portable station
		❑ Mobile station
Frequency band	:	2400 – 2483,5 MHz (Low Energy Bluetooth device)

2.1 Test Site

Company	:	CMC Centro Misure Compatibilità S.r.l.
Address	:	Via dell'Elettronica, 12/C
		36016 Thiene (VI) – ITALY
Test site facility's FCC registration number	:	271947

3. Testing and sampling

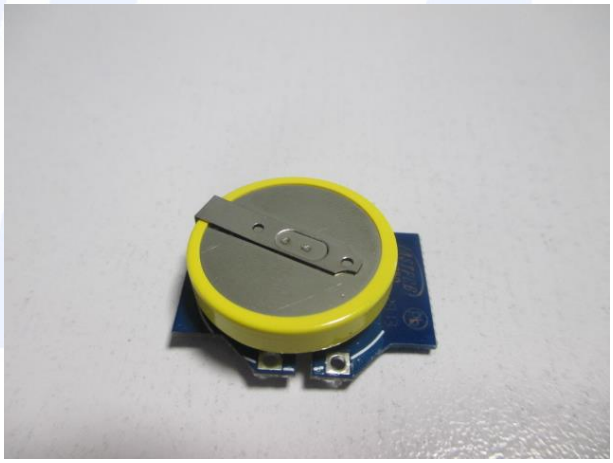
Date of receipt of test item	:	02.07.14
Testing start date	:	23.12.14
Testing end date	:	08.01.15
Samples tested nr.	:	1
Sampling procedure.	:	Equipment used for testing was picked up by the manufacturer, at the end of the production process with random criterion
Internal identification	:	adhesive label with the product number P140725

4. Operative conditions

EUT exercising	:	EUT in continuous transmission at maximum power

5. Photograph(s) of EUT

5.1 Photograph(s) of EUT



6. Equipment list

Id. number	*Manufacturer*	*Model*	*Description*	*Serial number*	*Last calibration*	*Due date calibration*
CMC S108	EMCO	3115	Horn Antenna	9811-5622	31 May 2013	May '16
CMC S127	Schaffner	HLA6120	Loop Antenna	1191	11 Nov 2013	January '16
CMC S136	Schwarzbeck	VULB 9163	Broadband Antenna	9136-205	29 May 2013	May '16
CMC S164	Rohde & Schwarz	ESU26	EMC interference receiver	100052	07 Jan 2014	January '15

7. Measurement uncertainty

Test	Expanded Uncertainty	note
Conducted Emission		
(50Ω/50µH AMN) - (9 kHz – 150 kHz)	±3.8 dB	1
(50Ω/50µH AMN) - (150 kHz – 30 MHz)	±3.3 dB	1
(Voltage probe) - (150 kHz – 30 MHz)	±3.3 dB	1
(50Ω/5µH AMN) - (150 kHz – 108 MHz)	±2.8 dB	1
Discontinuous Conducted Emission		
Conducted Emission (50Ω/50µH AMN) - (150 kHz – 30 MHz)	±3.3 dB	1
Disturbance Power (30 MHz – 300 MHz)	±3.9 dB	1
Radiated Emission		
(0,150 MHz – 30 MHz)	±4.3 dB	1
(30 MHz – 1000 MHz)	±4.4 dB	1
(1 GHz – 6 GHz)	±4.6 dB	1
Electromagnetic field EMF	±15.0 %	1
Harmonic current emissions test	±2.7 %	1
Voltage fluctuation and flicker test	±2.9 %	1
Insertion loss test	±2.7 dB	1
Radiated electromagnetic disturbance test (loop antenna)	±2.7 dB	1
Radiated electromagnetic field immunity test	0.77 V/m at 3V/m	1
Pulse modulated radiated electromagnetic field immunity test	0.77 V/m at 3V/m	1
Injected currents immunity test	0.48 V at 3V	1
Bulk current	5.3 mA at 60 mA	1
Power frequency magnetic field immunity test	0.1 A/m at 10 A/m	1
Effective radiated power (F < 1GHz)	±4.4 dB	1
Effective radiated power (F > 1GHz)	±3.9 dB	1
Frequency error	< 1x10-7	1
Modulation bandwidth	< 1x10-7	1
Adjacent channel power	±2.6 dB	1
Blocking	±2.6 dB	1
Electrostatic discharge immunity test		2
Electrical fast transients / burst immunity test		2
Surge immunity test		2
Pulse magnetic field immunity test		2
Damped oscillatory magnetic field immunity test		2
Short interruption immunity test		2
Voltage transient emission test	±2.2 %	1
Transient immunity test		2

Notes

Note 1:
The expanded uncertainty reported according to EN55016-4-2:2011 is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of p = 95%

Note 2:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence, covering factor k = 2.

8. Reference documents

Reference no.	*Description*
FCC Rules and Regulation Title 47 part 15:2013	--
ANSI C63.4:2009	American National Standard for Methods of Measuring of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz – 40 GHz
ANSI C63.10:2009	American National Standard for Testing Unlicensed Wireless Devices
KDB 558074 D01 DTS Meas Guidance v03r02	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
Internal Procedure PM001 rev. 2.0 (Quality Manual)	Measure Procedure
Internal procedure INC_M rev. 8.2 (Quality Manual)	Measurement uncertainty calculation

9. Deviation from test specification

In agreement with the client, emission tests were performed with peak detector.

At the frequencies where the measures exceed the limit or within 6 dB from it, the test was repeated with quasi-peak detector and/or average detector.

10. Test case verdicts

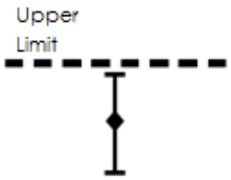
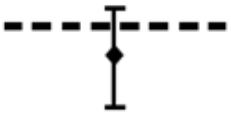
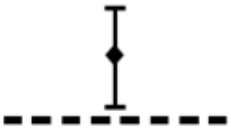
Test case does not apply to the test object ..... : N.A.
Test item does meet the requirement ..... : Complies
Test item does not meet the requirement..... : Does not comply
Test not performed ..... : N.E.

11. Results

In this clause tests results are reported.

Measurement uncertainty is in accordance with document CMC INC_M rev. 8.2.

Judgement of compliance:

Case 1	Case 2	Case 3	Case 4
			
The sample is Complies.	The sample is Complies.	The sample is Not Complies.	The sample is Not Complies.
The measurement results is within the specification limit when the measurement uncertainty is taken into account.	It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty although the measurement result is below the limit.	It is not possible to state compliance using a 95% coverage probability for the expanded uncertainty also the measurement result is upper the limit.	The measurement results is outside the specification limit when the measurement uncertainty is taken into account.

In agreement with ILAC-G8: 03/2009 Guidelines on the Reporting of Compliance with Specification.

11.1 Antenna requirements

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.203
- Internal procedure PM001
- See clause 4 of this test report
- Test date: 23 December 2014
- Technician: A. Bertezzolo

Test configuration

Test site:
Laboratory

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

--
Measurement uncertainty: See clause 7 of this test report

Test specification

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.
The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of §15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	99	52

Result

Antenna Type	*External R.F. power amplifier*	*Gain*	*Remarks*	*Results*
Integrated	Not Present	5,3 dBi	--	Complies

Result: The requirements are met

11.2 Emissions in restricted frequency bands and in unrestricted frequency bands

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part. 15.209
- Internal procedure PM001
- See clause 4 of this test report
- Test date: 07 January 2015
- Technician: A. Bertezzolo

Test configuration

Test site:
Semi-anechoic chamber

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S127, CMC S136, CMC S164
Measurement uncertainty: See clause 7 of this test report

Test specification

Port: Enclosure
Frequency range: 0,009 MHz – 1000 MHz
VBW automatically set ≥ 3 x RBW
Antenna polarization: Horizontal (H) – Vertical (V)
EUT – Antenna distance: 3 m
EUT height about the floor: 80 cm

Environmental conditions

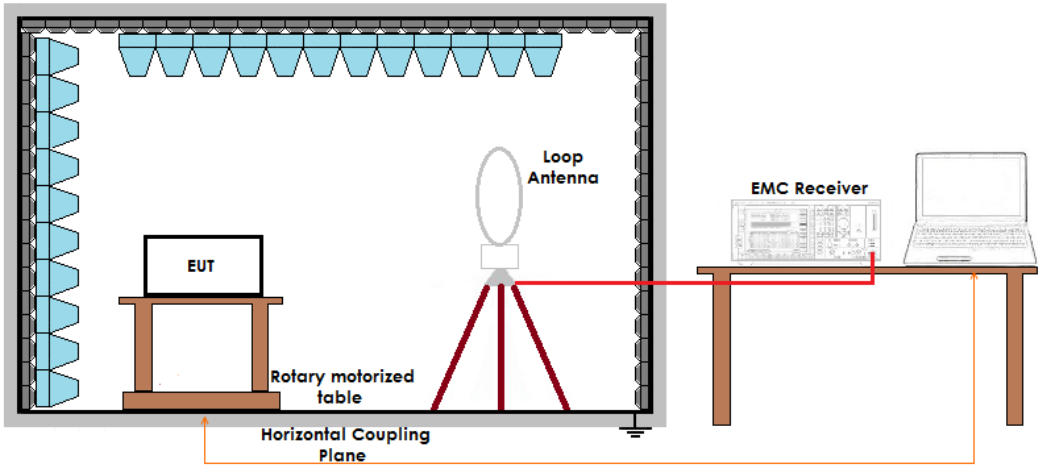
Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
22	99	49

Acceptance limits

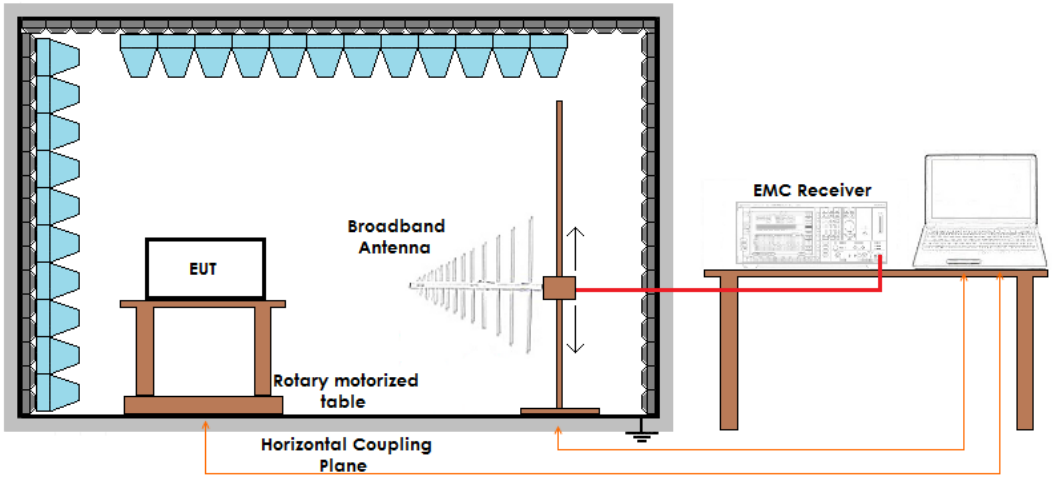
Frequency range (MHz)	*Limits [dB(µV/m)]*
0,009 to 0,490	128,51 to 93,80
0,490 to 1,705	73,80 to 62,97
1,705 to 30	69,54
30 to 88	40
88 to 216	43,52
216 to 960	46,02
Above 960	53,98
Remarks: The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.	

Setup

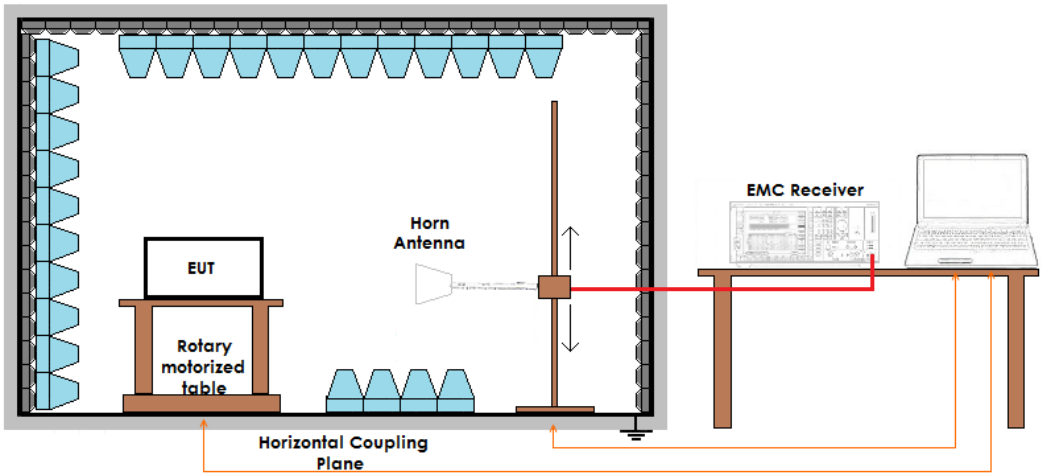
Frequency ≤ 30 MHz



Frequency ≤ 1 GHz



Frequency > 1 GHz



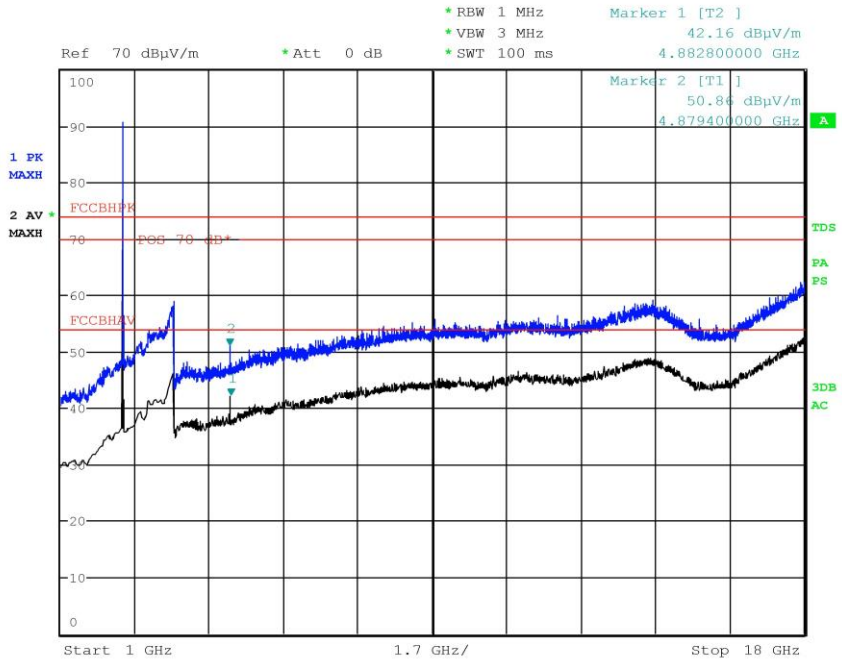
Result

Polarization	*Frequency Range (MHz)*	*Graphs*	*Remarks*	*Result*
Loop	0,009 – 30	G14235927	Worst case	Complies
V	30 – 1000	G14235928	Worst case	Complies
H	30 – 1000	G14235929	Worst case	Complies
H	1000 – 18000	G14235921	Worst case	Complies
V	1000 – 18000	G14235922	Worst case	Complies
V	18000 – 26000	G14235926	Worst case	Complies
H	18000 – 26000	G14235925	Worst case	Complies
Remarks: Peaks above the limits are caused by the nominal transmitting frequency				

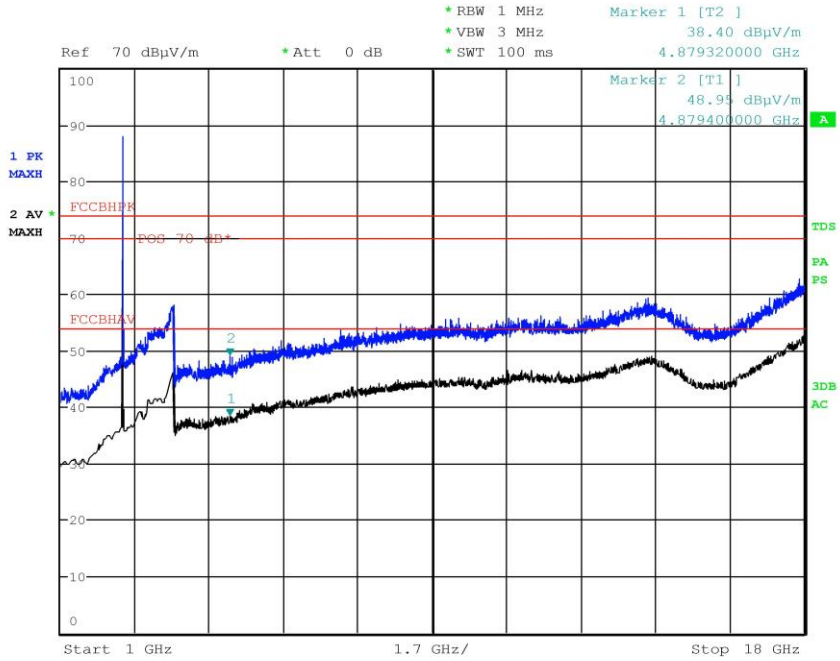
Graphs Legend
PK: Peak; QP [1s] (quasi-peak at 1 second) values are marked with a +
AV: Average; AV [1s] (average at 1 second) values are marked with a x

Graphs

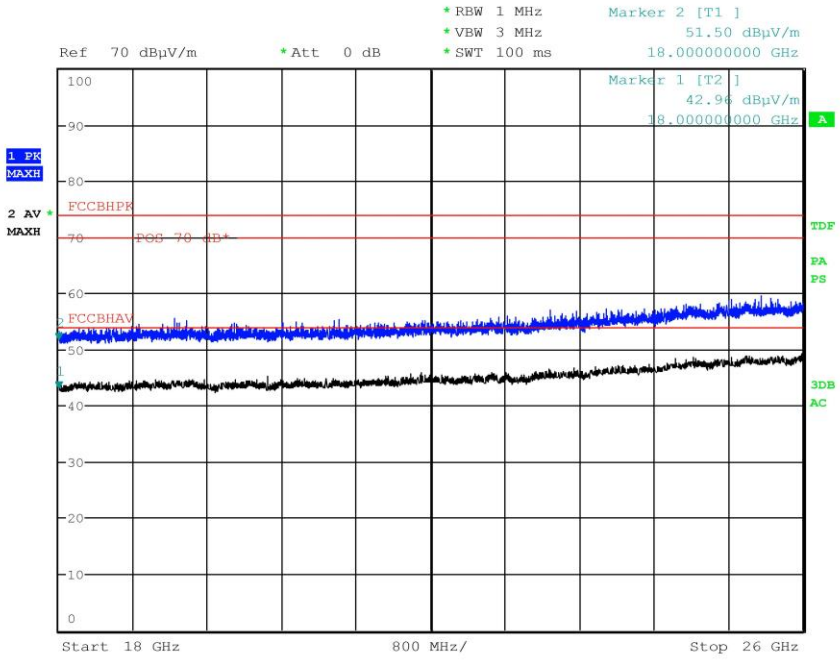
Meas Type
Equipment under Test
Manufacturer
OP Condition Fmed
Operator Bertezzolo 14235921
Test Spec
V



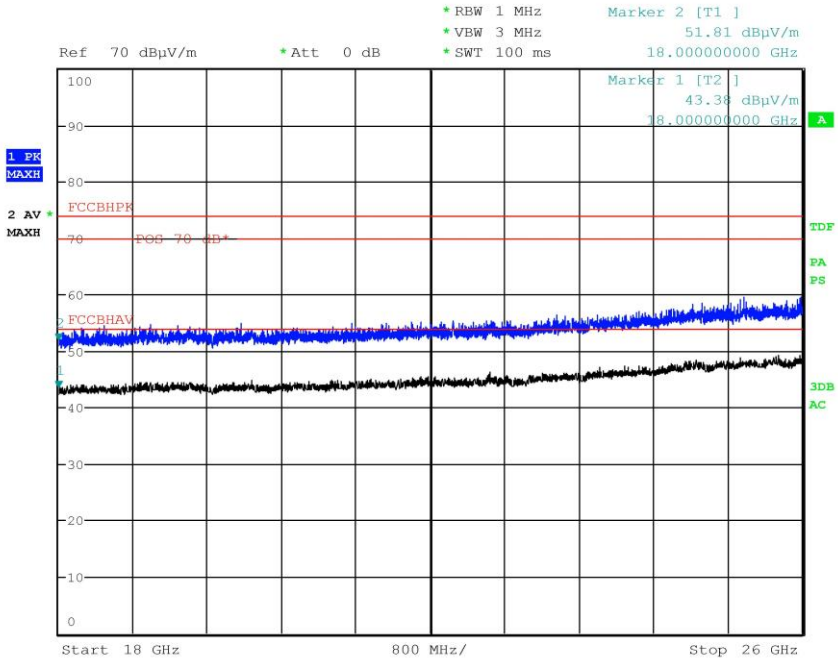
Meas Type
Equipment under Test
Manufacturer
OP Condition Fmed
Operator Bertezzolo 14235922
Test Spec
H



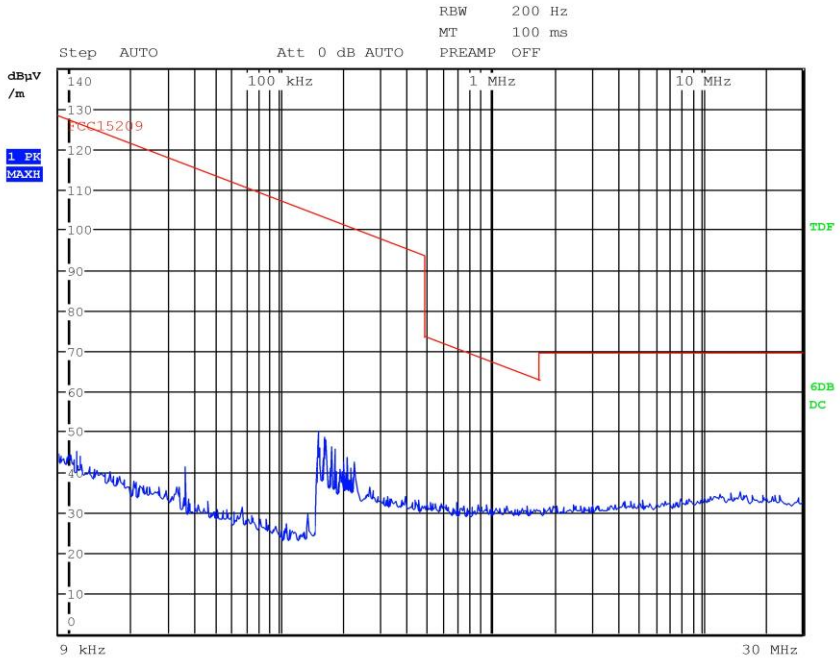
Meas Type
Equipment under Test
Manufacturer
OP Condition
Operator Bertezzolo 14235925
Test Spec
H



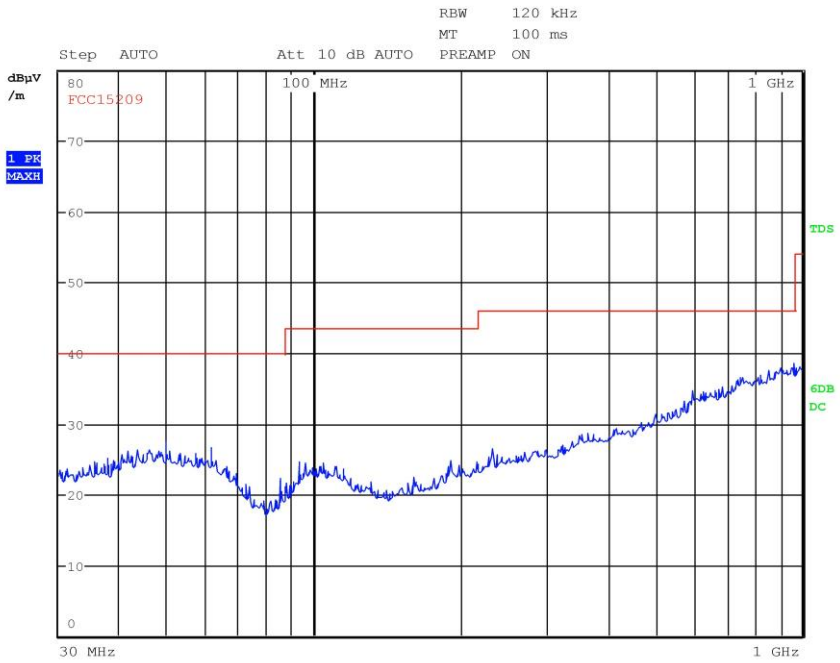
Meas Type
Equipment under Test
Manufacturer
OP Condition
Operator Bertezzolo 14235926
Test Spec
V



Meas Type
Equipment under Test
Manufacturer
OP Condition
Operator Bertezzolo 14235927
Test Spec
Loop



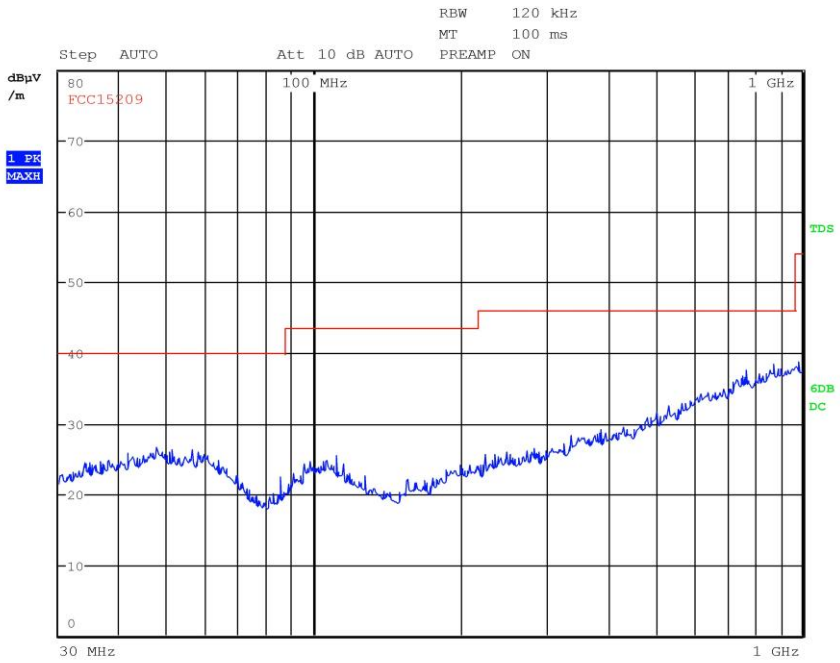
Meas Type
Equipment under Test
Manufacturer
OP Condition
Operator Bertezzolo 14235928
Test Spec
V



Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 0

Meas Type
Equipment under Test
Manufacturer
OP Condition
Operator Bertezzolo 14235929
Test Spec
H



Final Measurement

Meas Time: 1 s
Margin: 6 dB
Subranges: 0

Result: The requirements are met

11.3 DTS bandwidth

Test set-up and execution

- FCC Rules and Regulation; Titles 47 Part 15.247
- KDB 558074 D01 DTS Meas Guidance v03r02 cl. 8.1
- Internal procedure PM001
- See clause 4 of this test report
- Test date: 23 December 2014
- Technician: A. Bertezzolo

Test configuration

Test site:
Semi-anechoic chamber

Auxiliary equipment:
See clause 4 of this test report

EUT exercising

See clause 4 of this test report

Test equipment used

CMC S108, CMC S136, CMC S164
Measurement uncertainty: See clause 7 of this test report

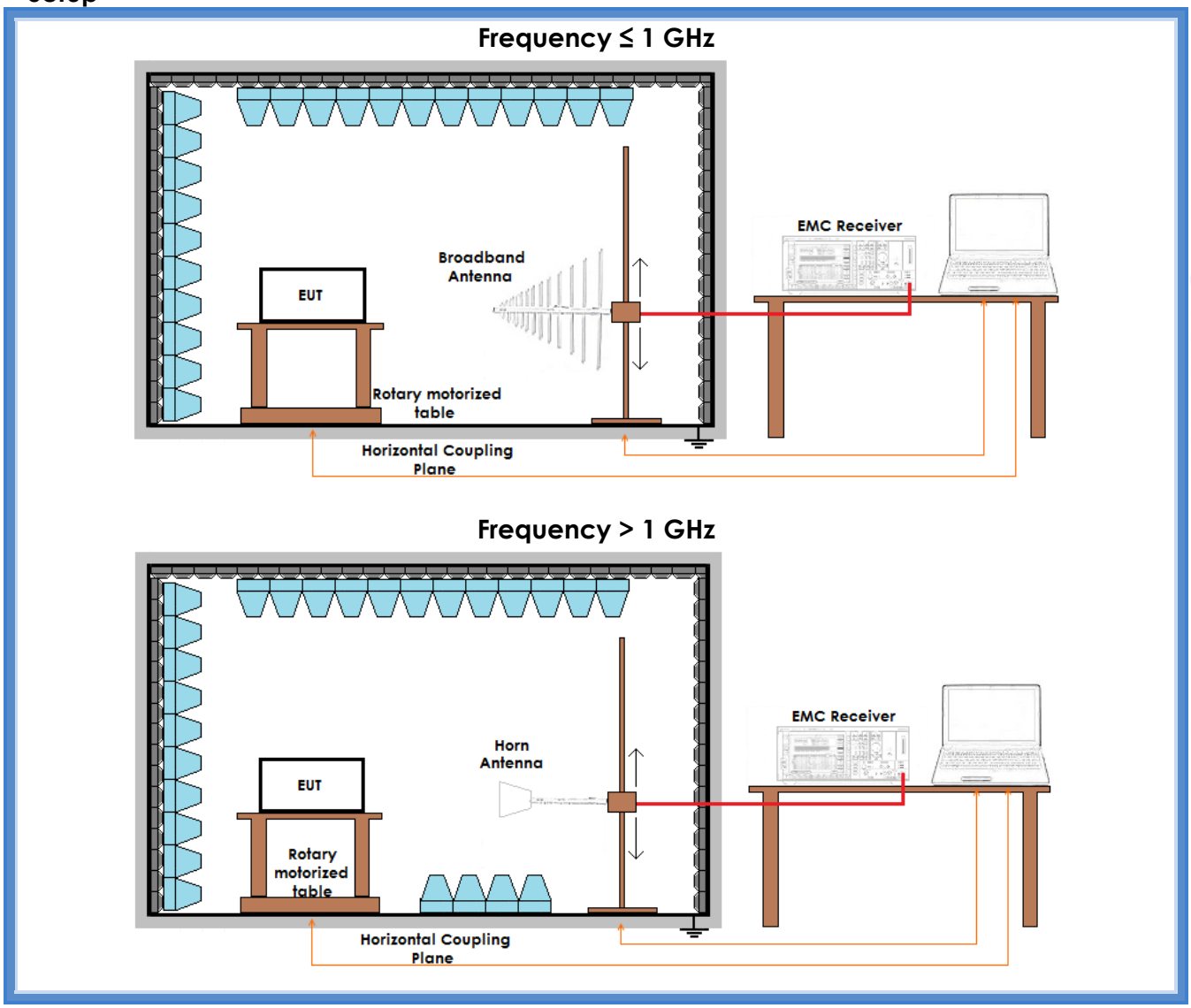
Test specification

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

Environmental conditions

Temperature (°C)	*Atmospheric pressure (kPa)*	*Relative humidity (%)*
21	99	50

Setup



Result

Channel	*Graphs*	*6 dB bandwidth (kHz)*	*Limits (kHz)*	*Results*
Lowest	G14235906	746,8	At least 500	Complies
Medium	G14235912	705,1	At least 500	Complies
Highest	G14235901	740,4	At least 500	Complies